

IN THE CLAIMS:

1. (canceled)
2. (previously presented) An apparatus according to Claim 54 where said precision knife guide has an elongated surface against which the face of the blade maintains sustained contact, said object having said hardened surface at two opposite locations, and one of said knife guides being disposed at each of said two opposite locations whereby each of the two edge facets may be alternately disposed in said two opposite locations to condition both of the two edge facets.
3. (previously presented) An apparatus according to Claim 54 where the effective length of the elongated precision knife guide is not less than about one inch in length.
4. (previously presented) An apparatus according to Claim 54 including a physical member to contact the knife blade and apply a force to press the blade against said knife guide as the blade is moved along said knife guide with the knife edge in sustained contact with said hardened surface.
5. (previously presented) An apparatus according to Claim 54 comprising a set of said hardened surfaces and one of said knife guides adjacent said surfaces, including an inverted U shaped spring member having cantilevered resilient arms and an intermediate connection portion, said connecting portion being between said set of hardened surfaces and each of said arms of

said spring member extending downwardly generally along a portion of a respective one of said precision knife guides.

6. (previously presented) An apparatus according to Claim 54 where the predetermined angle B of the adjacent facet relative to said contacted plane of said hardened surface is less than 10 degrees.

7. (previously presented) An apparatus according to Claim 54 where said hardened surface is the surface of a stationary cylindrical object having a longitudinal axis whereby the longitudinal axis would be mounted nominally perpendicular to the elongated edge of the blade.

8. (previously presented) An apparatus according to Claim 54 where said hardened surface is the surface of a rotatable cylindrical object having a longitudinal axis whereby the longitudinal axis would be mounted nominally perpendicular to the elongated edge of the blade.

9. (previously presented) An apparatus according to Claim 8 where a braking mechanism prevents rotation of said rotatable cylindrical object unless a torque is applied to said cylindrical object in excess of that applied by said braking mechanism.

10. (previously presented) An apparatus according to Claim 54 where said hardened surface of said object is restrained in a predetermined rest position relative to and adjacent said precision knife guide by a restraining mechanism that applies a

restraining force to position said object in said rest position, and said object being displaceable against the force of said mechanism by the force applied by the blade facet contacting said hardened surface of said object.

11. (previously presented) A knife-edge conditioning apparatus for modifying the physical structure along an elongated edge of a metal knife blade, the blade having two faces that at their terminus have been sharpened forming two facets that intersect to create the elongated edge at the junction of the two edge facets, said apparatus comprising at least one precision angle knife guide with which one face of the blade maintains sustained sliding or rolling contact in order to guide the elongated edge of the blade into sustained contact with a hardened surface of an object and to position the plane of one edge facet at a precise predetermined angle  $B$  relative to a plane of contact with said hardened surface, where said hardened surface is the surface of a stationary cylindrical object having a longitudinal axis mounted nominally perpendicular to the elongated edge of the blade, and where said cylindrical object is adjustable in order that different areas of said hardened surface of said cylindrical object can be selected as the contact point with the adjacent edge facet.

12. (previously presented) An apparatus according to Claim 54 where said hardened surface of said object is serially grooved at

the point of contact of said hardened surface with the elongated edge, and said grooves being oriented angularly to cross the elongated edge as the edge is moved across said grooved hardened surface.

13. (canceled)

14. (previously presented) An apparatus according to Claim 24 where said blade guides are elongated including an inverted U shaped spring member having cantilevered resilient arms and an intermediate connecting portion over each of said sharpening, conditioning, and finishing stages with at least one of said resilient arms extending downwardly generally along a portion of said blade guides.

15. (previously presented) An apparatus according to Claim 54 where said at least one angle knife guide is designed to insure reproducibly and precisely guiding the blade edge into contact with said hardened surface and aligning at said angle B with an angular precision of better than 3 degrees.

16. (previously presented) An assembly according to Claim 57 where said sharpening stage comprises at least one disk having an exposed abrasive surface, said disk being mounted on a shaft for rotation, a blade guide surface juxtaposed said disk to guide one side face of the blade to bring the blade edge into contact with a surface of said rotating disk, said blade guide surface being at a predetermined vertical angle A relative to the plane of

surface of said disk at point of contact with the blade facet, said blade guide surface being in a plane that intersects said abrasive surface, said edge conditioning stage comprising at least one associated precision angle blade guide with which the face of the blade maintains sustained contact and which guides the elongated blade cutting edge into contact with the hardened surface of at least one object, and said conditioning stage blade guide having a guide plane at a predetermined angle C relative to the plane of said hardened surface at point of contact of the blade edge.

17. (previously presented) An assembly according to Claim 16 where said object in a rest position can be displaced by an exerting force exerted by the blade edge against said hardened surface of said object against a predetermined restraining force of a resilient means that upon release of said exerting force repositions said hardened surface to said rest position.

18. (previously presented) An assembly according to Claim 16 where the angular difference between angle A and angle C is less than 10 degrees.

19. (previously presented) An assembly according to Claim 16 where said blade guide of said conditioning stage is elongated including an inverted U shaped spring member having cantilevered resilient arms and an intermediate connecting portion being over said hardened surface with at least one of

said resilient arms extending downwardly generally along a portion of said blade guide.

20. (previously presented) An assembly according to Claim 16 where said hardened surface is the surface of a cylindrical object having an axis nominally perpendicular to the elongated edge of the blade.

21. (previously presented) An assembly according to Claim 20 where a braking mechanism prevents rotation of said cylindrical object unless a torque is applied to said hardened surface of said cylindrical object by the blade edge in excess of that applied by said braking mechanism.

22. (previously presented) An assembly according to Claim 20 where structure is included to adjust the position of said object in order that different areas of the hardened surface of said cylindrical object can be selected as the contact point with the elongated blade edge.

23. (previously presented) An assembly according to claim 16 where said hardened surface is serially grooved at the point of contact of said hardened surface with the elongated edge, said grooves being angularly oriented to cross the elongated edge as the edge is moved across said grooved hardened surface.

24. (previously presented) An assembly according to Claim 57 including an edge finishing stage, said sharpening stage comprising at least one disk having an exposed abrasive surface,

said disk being mounted on a shaft for rotation, a blade guide surface juxtaposed said disk to guide one face of the blade to bring the blade edge into contact with surface of said rotating disk, said blade guide surface being at a predetermined vertical angle A relative to the plane of abrasive surface of said disk at point of contact with the blade edge, said blade guide surface being in a plane that intersects said abrasive surface, said edge conditioning stage blade guide having a guide plane at a predetermined angle C relative to a plane of said hardened surface at point of contact of the blade edge with said hardened surface said finishing stage comprising at least one finishing disk having an exposed abrasive surface, said finishing disk being mounted on a shaft for rotation, one finishing blade guide surface juxtaposed said disk to guide one face of the blade to bring the blade edge into contact with the surface of said rotating disk, said finishing blade guide surface being in a plane that intersects said abrasive surface, set at predetermined angle D relative to the plane of the abrasive surface of said disk at point of contact with the blade edge.

25. (previously presented) An assembly according to Claim 24 where the angular difference between angle A and angle C is less than 10 degrees and the angular difference between angle A and D is less than 3 degrees.

26. (previously presented) An assembly according to Claim 24

where said object in a rest position can be displaced by an exerting force exerted by the blade edge against said hardened surface of said object against the predetermined restraining force of a resilient structure that upon release of said exerting force repositions said hardened surface to said rest position.

27. (previously presented) An assembly according to Claim 24 where said blade guides are elongated including an inverted U shaped spring member having cantilevered resilient arms and an intermediate connecting portion over said edge sharpening, edge conditioning, and edge finishing stages with at least one of said resilient arms extending downwardly generally along a portion of said blade guides.

28. (previously presented) An assembly according to Claim 24 where said hardened surface of said object is the surface of a cylindrical object having a longitudinal axis to be nominally perpendicular to the elongated edge of said blade.

29. (currently amended) An ~~apparatus~~ assembly according to Claim 28 where a braking mechanism prevents rotation of said cylindrical object unless a torque is applied to said hardened surfaces of said cylindrical object by the blade edge in excess of that applied by said braking mechanism.

30. (previously presented) An assembly according to Claim 57 where said sharpening stage includes at least one blade guide juxtaposed said abrasive surface to guide one side face of blade



to bring the blade edge into contact with said abrasive surface, said blade guide surface being at a predetermined angle A relative to the plane of said abrasive surface at point of contact with the blade facet, said edge conditioning stage blade guide having a guide plane at predetermined angle C relative to plane of said hardened surface at point of contact of the blade edge with said hardened surface.

31. (previously presented) An assembly according to Claim 30 where said object in a rest position can be displaced by an exerting force exerted by said blade edge against said hardened surface of said object against the predetermined restraining force of a resilient structure that upon release of said exerting force of the blade edge repositions said hardened surface to said rest position.

32. (previously presented) An assembly according to Claim 30 where the angular difference between angle A and angle C is less than 10 degrees.

33. (previously presented) An assembly according to Claim 30 where at least one of said blade guides includes a spring type member that contacts the blade providing a restraining force that presses the side face of the blade into contact with said blade guide surface.

34. (previously presented) An assembly according to Claim 30 where said blade guide of said edge conditioning stage is

elongated including an inverted U shaped spring member having cantilevered resilient arms and an intermediate connecting portion being over said hardened surface with at least one of said resilient arms extending downwardly generally along a portion of said blade guide.

35. (previously presented) An assembly according to Claim 31 where said hardened surface is the surface of a cylindrical object having a longitudinal axis nominally perpendicular to the elongated edge of the blade.

36. (previously presented) An assembly according to Claim 34 where a braking mechanism prevents rotation of said cylindrical object unless a torque is applied to said hardened surface of said cylindrical object in excess of that applied by said braking mechanism.

37. (previously presented) An assembly according to Claim 35 where structure is included to adjust the position of said object in order that different areas of the hardened surface of said cylindrical object can be selected as the contact point with the elongated blade edge.

38. (previously presented) An assembly according to Claim 30 where said hardened surface is serially grooved at the point of contact of said hardened surface with the elongated edge, and said grooves being angularly oriented to cross the elongated edge as the edge is moved across said grooved hardened surface.

39. (canceled)

40. (canceled)

41. (previously presented) A combined apparatus with a knife sharpener and an edge conditioning assembly for modifying the physical structure of the elongated edge of a knife blade, the blade having two faces that at their extremity each have a facet that intersects to form the elongated edge, said knife sharpener comprising at least one skiving surface for skiving said facet, and said edge conditioning assembly comprising an angle guide for physical contact with the blade to direct the edge into sliding physical contact with at least one hardened surface of an object made of a material without tendency to abrade, and said material comprising means to create micro serrations in the blade edge when the blade is moved along said guide with its elongated edge in contact with said hardened surface after the blade has been sharpened by said knife sharpener.

42. (previously presented) An apparatus comprising a facet sharpening stage and an edge conditioning stage for a knife blade having two faces that at their extremities have facets that intersect to create an elongated edge at the terminus of the two edge facets, said facet sharpening stage comprising at least one abrasive member that removes metal from the entire facet surfaces to create a new facet along the blade edge, said edge conditioning stage comprising an object having two hardened

surfaces each of which is disposed adjacent to a precision angle knife guide with which the blade maintains sustained contact in order to guide the lower portion of each facet adjacent the edge into contact with its said hardened surface, the angular plane of said hardened surface at the area of contact positioned sufficiently different from the angular plane of the surface of the contacting facet to insure that said contact is made only at the terminus or lower portion of the facets adjacent to the terminus.

43. (previously presented) An apparatus according to Claim 42 where the said angular difference between said angular plane of said hardened surface and the plane of the facet is finite and less than  $10^\circ$ .

44. (previously presented) An apparatus according to Claim 54 where the angular plane of said hardened surface at the area of contact is positioned sufficiently different from the angular plane of the surface of the contacting facet to insure that said contact is made only at the elongated edge or the lower portion of the facets adjacent the edge.

45. (previously presented) An apparatus according to Claim 54 where a predetermined fixed angle C is formed between the guide surface of said knife guide and said plane of contact of said hardened surface, and said hardened surface having a hardness above Rockwell C-60.

46. (previously presented) An apparatus according to Claim 45 where said apparatus is a conditioning station in a device having a handle outwardly of said station.

47. (previously presented) An apparatus according to Claim 45 where there are at least two linearly aligned of said objects each having said hardened surface, and said knife guide having a guide plane for use with said at least two objects.

48. (previously presented) An apparatus according to Claim 47 where said guide plane is the guide surface of a single knife guide.

49. (previously presented) An apparatus according to Claim 45 where there are two of said knife guides which are parallel to each other with said object between said knife guides.

50. (previously presented) An apparatus according to Claim 45 where said object is mounted to a support member, said knife guide being pivotally mounted to said support member, and adjusting structure controlling the angle of orientation of said knife guide.

51. (previously presented) An apparatus according to Claim 54 where said knife guide comprises at least two aligned rods or rollers which define an extended guide plane.

52. (previously presented) An apparatus according to Claim 54 where said apparatus is a conditioning station in a knife sharpener having at least one sharpening station.

53. (previously presented) A method of conditioning a knife-edge to create micro imperfections of controlled size and frequency along the elongated edge of a knife blade by modifying the physical structure along the elongated edge of a metal knife, wherein the blade has two faces at their terminus which have been sharpened to form two edge facets that intersect to create the elongated edge at the junction of the two edge facets, the method including the steps of providing a conditioning apparatus to include an object having a substantially non-abrasive hardened surface which is at least as hard as the metal of the knife blade and with the hardened surface being at two opposite locations of the object, providing at each of the locations at least one precision knife guide having a guide surface near and at a fixed angle C to the relative to the plane of the hardened surface at the point of contact with the blade edge, alternately placing a face of the blade against the guide surface with the elongated edge of the blade in sustained contact with the hardened surface at each of the locations, positioning the plane of one edge facet at a precise predetermined angle B relative to the plane of contact with the hardened surface and with the one edge facet forming an angle A with the guide surface wherein the angle B is the angle C minus the angle A, repeatedly at each of the locations creating back and forth movement between the elongated edge of the blade and the hardened surface while maintaining

sustained contact therebetween without tendency to abrade the blade face, and repeatedly creating and fracturing a microstructure along the blade at the extreme terminus of the edge facets during the sustained contact to create a microserrated structure by repeatedly stress hardening and fracturing and breaking off the edge.

54. (currently amended) In a knife-edge enhancing apparatus for modifying the physical structure along an elongated edge of a knife blade, the blade having two faces that at their terminus have been sharpened forming two edge facets that interact to create the elongated edge at the junction of the two edge facets, said apparatus comprising at least one precision angle knife guide with which one face of the blade maintains sustained ~~sliding or rolling~~ contact in order to guide the elongated edge of the blade into sustained contact with a blade edge contacting member, the improvement being in that in place of a sharpening member having an abrasive surface as the contacting member, the contacting member is a knife-edge conditioning member which is a hardened surface of an object located to position a plane of one adjacent edge facet at a precise predetermined non-zero degree angle  $B$  relative to the plane of contact with said hardened surface, there being at least one of said objects with said hardened surface disposed at a knife guide whereby each of the blade faces may selectively be placed against a knife guide to

selectively dispose each of the facets against a hardened surface at said angle B, and said hardened surface being sufficiently non-abrasive which in combination with said knife guide comprises means to minimize interference with burr removal and to repeatedly create and fracture a microstructure along the edge of the blade at the extreme terminus of the edge facets during repeated contact of the facets and said hardened surface to create a micro serrated edge.

55. ((previously presented) An apparatus according to Claim 54 including a handle to be held by a user during use whereby said apparatus is a manual apparatus.

56. (previously presented) An apparatus according to Claim 54 where said hardened surface has a surface roughness no greater than 10 microns.

57. (previously presented) In a multi-stage assembly for modifying the physical structure of an elongated edge of a knife blade, the knife blade having two faces that at their extremity each have a facet that intersects to form the elongated edge, said multi-stage assembly including at least a first stage and a second stage, said first stage being an edge sharpening stage comprising at least one abrasive surface for abrading the facet, the improvement being in that said second stage is an edge conditioning stage comprising at least one precision angle knife guide with which one face of the blade maintains sustained



sliding or rolling contact in order to guide the elongated edge of the blade into sustained contact with a hardened surface of an object and said guide positions the plane of one edge facet at a precise predetermined angle  $B$  relative to the plane at the point of contact with said hardened surface, and said hardened surface being made of a material which is substantially non-abrasive to create micro serrations in the blade edge after the blade edge has been sharpened in said first stage.

58. (new) An apparatus according to claim 54 wherein a clamp is secured to said knife guide for locking the blade to said knife guide, and said hardened surface of said object being movably mounted whereby the edge of the blade may be maintained in contact with said hardened surface while said hardened surface is moving.

59. (new) An apparatus according to Claim 58 wherein the angle between said knife guide and said hardened surface is adjustable by adjusting the position of said hardened surface.

60. (new) An apparatus according to Claim 58 wherein the angle between said knife guide and said hardened surface is adjustable by adjusting the position of said knife guide.

61. (new) An apparatus according to Claim 58 wherein said object having said hardened surface is mounted on a post, and said post being slidably mounted with respect to said knife guide.

62. (new) An apparatus according to Claim 61 wherein said object

having said hardened surface is slidably mounted on said post to adjust the vertical position of said object with respect to said knife guide, and said knife guide being located below said hardened surface.